



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,156	06/22/2006	Juan Schneider	16740-2US JP/mp	5078
20988	7590	05/11/2009	EXAMINER	
OGILVY RENAULT LLP 1981 MCGILL COLLEGE AVENUE SUITE 1600 MONTREAL, QC H3A2Y3 CANADA				TRAN, BINH X
ART UNIT		PAPER NUMBER		
1792				
			MAIL DATE	DELIVERY MODE
			05/11/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/584,156	SCHNEIDER ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Binh X. Tran	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 6-22-2006.  
 2a) This action is **FINAL**.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-47 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-5,8-17,20-34 and 37-47 is/are rejected.  
 7) Claim(s) 6,7,18,19,35 and 36 is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>06/22/2006</u> .  | 6) <input type="checkbox"/> Other: _____ .                        |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 11-12, 46-47 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 11-12, 46-47 are product by process claims. According to MPEP 2113, “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production”. Thus, the examiner does not give any patentable weight on the method of production. In claims 11-12, 46-47, applicants only discloses the method of production. Since the patentability of a product does not depend on its method of production, claims 12-12, 46-47 fail to further limit the subject matter of a previous claim.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:
- The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
3. Claims 11-12, 46-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term “transmission electron microscopy” in claims 11 and 46 is used by the claim to mean “a method for applying the nanosized catalytic particles on the carbon substrate”, while the accepted meaning is a microscopy technique using a beam of electrons transmitted through an ultra thin specimen, which is capable of imaging at significantly higher resolution than light microscope (See prior art made of record). Transmission electron microscopy is not a deposition or coating method for nanosized catalytic particles. Transmission electron microscopy certainly can be used to image (i.e. observe) the catalytic particles on the substrate. However, it cannot be used to apply the particles on the substrate. The term is indefinite because the specification does not clearly redefine the term.

Where applicant acts as his or her own lexicographer to specifically define a term of a claim contrary to its ordinary meaning, the written description must clearly redefine the claim term and set forth the uncommon definition so as to put one reasonably skilled in the art on notice that the applicant intended to so redefine that claim term. *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1357, 52 USPQ2d 1029, 1033 (Fed. Cir. 1999). The term “apparatus producing Langmuir-Blodgett films” in claim11 and 46 is used by the claim to mean “a method for applying the nanosized catalytic particles on

the carbon substrate”, while the accepted meaning is “an apparatus (not a process) to producing a film.” It is noted that applicants already recites Langmuir-Blodgett method in claim 11 and 46. The term is indefinite because the specification does not clearly redefine the term.

Claims 12, 47 are indefinite because they depend on indefinite claims 11 or 46.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 37-39, 42-43, 46-47 are rejected under 35 U.S.C. 102(b) as being anticipated by Smiljanic et al. (Chemical Physics Letters 342, "Growth of Carbon Nanotubes on Ohmically Heated Carbon Paper", 2001, pages 503-509); hereinafter refer as Smiljanic.

Respect to claim 1, Smiljanic discloses a method of manufacturing a nanotube growth mat comprising:

providing a substrate includes carbon (i.e. carbon paper; See abstract, Fig 1);

applying nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (page 504-505).

Respect to claim 13, Smiljanic further disclose the step of activating the mat (i.e. ohmically heating the substrate) and flowing a carrier gas (i.e. Ar gas, H<sub>2</sub>, carbon-containing gas) in a direction whereby the nanotubes are produced from the mate on a continuous basis (Fig 1, page 504-505).

Respect to claims 2 and 14, Smiljanic disclose the substrate is porous (page 504, col. 2).

Respect to claims 8, 10, 26, Smiljanic discloses the catalytic particles are metal (i.e. Ni-Co, or Fe) (page 505, Fig 2-4). Respect to claim 20, Smiljanic discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as ethylene; a hydrogen source, and an inert (i.e. Ar) (See Fig 1, page 505). Respect to claims 21-22, Smiljanic discloses the inert gas is Ar. Respect to claim 25, Smiljanic discloses that activating the mat is achieved by applying an electric current across the mat (abstract, page 504 col. 2).

Respect to claim 29, Smiljanic discloses a mat comprising:  
a substrate includes carbon (i.e. carbon paper; See abstract, Fig 1);  
nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (page 504-505).

Respect to claim 30, Smiljanic discloses the mat comprising an electrical connection (Fig 1, page 504, col. 2). Respect to claim 31, Smiljanic discloses the substrate is porous (page 504, col. 2).

Respect to claim 37, Smiljanic discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as ethylene; a hydrogen source, and an inert (i.e. Ar) (See Fig 1, page 505). Respect to claims 38-39, Smiljanic discloses the inert gas is Ar. Respect to claim 42, Smiljanic discloses that activating the mat is achieved by applying an electric current across the mat (abstract, page 504 col. 2). Respect to claim 43, Smiljanic discloses the catalytic particles are metal (i.e. Ni-Co, or Fe) (page 505, Fig 2-4).

Respect to claims 11-12, 46-47 as discussed above the examiner does not give any patentable weight on the method of production. It is noted that Smiljanic discloses an identical mat having nanosized catalytic particles with applicant's mat. Further, Smiljanic also teaches to use transmission electron microscopy (TEM) (See pages 505, col. 1; page 506 col. 2, Fig 3).

6. Claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 37-39, 42-43, 46-47 are rejected under 35 U.S.C. 102(e) as being anticipated by Dodelet et al. (US 6,887,451 B2); hereinafter refer as Dodelet ('451).

Respect to claim 1, Dodelet ('451) discloses a method of manufacturing a nanotube growth mat comprising:

providing a substrate (1) includes carbon (i.e. carbon paper; See abstract; col. 2 lines 62-67);

applying nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (col. 2 lines 30-67, col. 3 lines 5-10).

Respect to claim 13, Dodelet ('451) further disclose the step of activating the mat (col. 3 lines 1-5) and flowing a carrier gas (i.e. Ar gas, H<sub>2</sub>, carbon-containing gas) in a direction whereby the nanotubes are produced from the mate on a continuous basis (Fig 1, col. 3 lines 5-29).

Respect to claims 2 and 14, Dodelet ('451) discloses the substrate is porous (substrate comprises fiber or mesh; See col. 3 lines 17-22, 45-55). Respect to claim 4 and 16, Dodelet ('451) discloses the substrate comprises non-carbon elements (i.e. silicate monolayer) selected from the group consisting of Si to produce a hetero-substrate (See col. 2 lines 52-61). Respect to claim 5 and 17, Dodelet ('451) discloses the substrate (carbon paper) and the hetero-substrate (silicate layer) are placed in a multilayer configuration (col. 2 lines 52-67).

Respect to claims 8, 10, 26, Dodelet ('451) discloses the catalytic particles are metal (i.e. Fe, Co, Ni; See col. 3 lines 23-25, lines 45-50). Respect to claim 20, Dodelet ('451) discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as C<sub>2</sub>H<sub>4</sub>; a hydrogen source, and an inert (i.e. Ar) (col. 3 lines 10-15). Respect to claims 21-22, Dodelet ('451) discloses the inert gas is Ar (col. 3 lines 10-15). Respect to claim 25, Dodelet ('451) discloses that activating the mat is achieved by applying an electric current across the mat (col. 3 lines 1-5).

Respect to claim 29, Dodelet ('451) discloses a mat comprising:

a substrate includes carbon (i.e. carbon paper; See abstract, Fig 1, col. 2 lines 62-67);

nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (col. 2 lines 30-67; col. 3 lines 5-10).

Respect to claim 30, Dodelet ('451) discloses the mat comprising an electrical connection (2) (See col. 2 lines 62 to col. 3 lines 5. Respect to claim 31, Dodelet ('451) discloses the substrate is porous (i.e. substrate comprises fiber or mesh; See col. 3 lines 17-22, 45-55).

Respect to claim 37, Dodelet ('451) discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as C<sub>2</sub>H<sub>4</sub>; a hydrogen source, and an inert (i.e. Ar) (col. 3 lines 10-15). Respect to claims 38-39, Dodelet ('451) discloses the inert gas is Ar. Respect to claim 42, Dodelet ('451) discloses that activating the mat is achieved by applying an electric current across the mat (col. 2 lines 67 to col. 3 line 5). Respect to claim 43, Dodelet ('451) discloses the catalytic particles are metal (i.e. Fe, Co, Ni; See col. 3 lines 23-25, lines 45-50).

Respect to claims 11-12, 46-47 as discussed above the examiner does not give any patentable weight on the method of production. It is noted that Dodelet ('451) discloses an identical mat having nanosized catalytic particles with applicant's mat. Further, Dodelet ('451) also teaches to use transmission electron microscopy (TEM) (See col. 3 lines 37-60).

Art Unit: 1792

7. Claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 37-39, 42-43, 46-47 are rejected under 35 U.S.C. 102(e) as being anticipated by Dodelet et al. (US 2003/0111334 A1); hereinafter refer as Dodelet ('334).

Respect to claim 1, Dodelet ('334) discloses a method of manufacturing a nanotube growth mat comprising:

providing a substrate includes carbon (i.e. carbon paper; paragraph 0009, 0027, 0033,);

applying nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (paragraph 0009, 0027-0028, 0034, 0038-0039).

Respect to claim 13, Dodelet ('334) further discloses the step of activating the mat (paragraph 0028, 0039) and flowing a carrier gas (i.e. Ar gas, H<sub>2</sub>, carbon-containing gas) in a direction whereby the nanotubes are produced from the mat on a continuous basis (paragraph 0028, 0035).

Respect to claims 2 and 14, Dodelet ('334) discloses the substrate is porous (paragraph 0009). Respect to claims 8, 10, 26, Dodelet ('334) discloses the catalytic particles are metal selected from the group consisting of Fe, Co, Ni, Mo (paragraph 0029, 0034, 0038-0039). Respect to claim 20, Dodelet ('334) discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as C<sub>2</sub>H<sub>4</sub>; a hydrogen source, and an inert (i.e. Ar) (paragraph 0028, 0035). Respect to claims 21-22, Dodelet ('334) discloses the inert gas is argon (paragraph 0028, 0034). Respect to claim 25,

Dodelet ('334) discloses that activating the mat is achieved by applying an electric current across the mat (paragraph 0028, 0035, 0039).

Respect to claim 29, Dodelet ('334) discloses a mat comprising:

a substrate includes carbon (i.e. carbon paper; See abstract, paragraph 0009, 0027, 0033);

nanosized catalytic particles on the substrate in a predetermined pattern, the pattern promoting growth in an organized manner from the catalytic particles as a function of the pattern (paragraph 0009, 0027-0028, 0034, 0038-0039).

Respect to claim 30, Dodelet ('334) discloses the mat comprising an electrical connection (paragraph 0028, 0035, 0039). Respect to claim 31, Dodelet ('334) discloses the substrate is porous (paragraph 0009).

Respect to claim 37, Dodelet ('334) discloses the carrier gas comprises a carbon source (i.e. carbon-containing gas such as C<sub>2</sub>H<sub>4</sub>; a hydrogen source, and an inert (i.e. Ar) (paragraph 0028, 0035). Respect to claims 38-39, Dodelet ('334) discloses the inert gas is Ar (paragraph 0039, 0035). Respect to claim 42, Dodelet ('334) discloses that activating the mat is achieved by applying an electric current across the mat (paragraph 0028, 0035, 0044). Respect to claims 43, Dodelet ('334) discloses the catalytic particles are metal selected from the group consisting of Fe, Co, Ni (paragraph 0029, 0038).

Respect to claims 11-12, 46-47 as discussed above the examiner does not give any patentable weight on the method of production. It is noted that Dodelet ('334) discloses an identical mat having nanosized catalytic particles with applicant's mat.

Further, Dodelet ('334) also teaches to use transmission electron microscopy (TEM) (See 0030).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 3-5, 15-17, 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smiljanic as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 above and further in view of Takikawa et al. (US 2003/0188963 A1), herein after refer as Takikawa ('963).

Respect to claims 3, 15 and 32 Smiljanic fails to disclose the substrate includes a patterned monolayer of carbon nano or micro particles. However, Smiljanic clearly discloses the substrate is carbon fiber. Takikawa ('963) discloses monolayer carbon

nanotube comprises carbon nano-particles (paragraph 0085-0090). It would have been obvious to one of ordinary skill in the art, at the time of invention, to modify Smiljanic in view of Takikawa ('963) by using monolayer of carbon nano-particles because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 4, 16 and 33, Smiljanic discloses the substrate comprises non-carbon elements (i.e. silicate layer) selected from the group consisting of Si to produce a hetero-substrate (See page 505, 2<sup>nd</sup> column, page 507, 2<sup>nd</sup> column). Respect to claims 5, 17 and 34, Smiljanic discloses the substrate (carbon paper) and the hetero-substrate (silicate layer) are placed in a multilayer configuration (Fig 2A, page 505, col. 2).

11. Claims 3-5, 15-17, 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodelet ('334) as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 28-31, 33-34, 37-39, 42-43, 45-47 above and further in view of Takikawa et al. (US 2003/0188963 A1), herein after refer as Takikawa ('963).

Respect to claims 3, 15 and 32, Dodelet ('334) fails to disclose the substrate includes a patterned monolayer of carbon nano or micro particles. However, Dodelet ('334) clearly discloses the substrate is carbon fiber (paragraph 0030). Takikawa ('963) discloses monolayer carbon nanotube comprises carbon nano-particles (paragraph 0085-0090). It would have been obvious to one of ordinary skill in the art, at the time of invention, to modify Dodelet ('334) in view of Takikawa ('963) by using monolayer of carbon nano-particles because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 4, 16 and 33, Dodelet ('334) discloses the substrate comprises non-carbon elements (i.e. silicate monolayer) selected from the group consisting of Si to produce a hetero-substrate (paragraph 0027). Respect to claims 5, 17 and 34, Dodelet ('334) discloses the substrate (carbon paper) and the hetero-substrate (silicate layer) are placed in a multilayer configuration (paragraph 0027).

12. Claims 9, 27-28, 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smiljanic as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 and further in view of Takikawa (US 2003/0148097 A1).

Respect to claims 9, 27 and 44, Smiljanic fails to disclose the catalyst are deposited in a monolayer. However, Smiljanic clearly discloses to deposit metal catalyst. Takikawa ('097) teaches to deposit either multi-layer catalyst or monolayer catalyst (paragraph 0056, 0076). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Smiljanic in view of Takikawa ('097) by depositing monolayer catalyst because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 28, 45, Smiljanic discloses the catalytic particles are metal selected from the group consisting of Fe, Co, Ni (page 503, col.2).

13. Claims 9, 27-28, 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodelet ('334) as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 and further in view of Takikawa (US 2003/0148097 A1).

Respect to claims 9, 27 and 44, Dodelet ('334) fails to disclose the catalyst are deposited in a monolayer. However, Dodelet clearly discloses to deposit metal catalyst.

Takikawa ('097) teaches to deposit either multi-layer catalyst or monolayer catalyst (paragraph 0056, 0061, 0076). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Dodelet ('334) in view of Takikawa ('097) by depositing monolayer catalyst because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 28, 45 Dodelet ('334) discloses the catalytic particles are metal selected from the group consisting of Fe, Co, Ni (paragraph 0029, 0038).

14. Claims 9, 27-28, 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodelet ('451) as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 and further in view of Takikawa (US 2003/0148097 A1).

Respect to claims 9, 27 and 44, Dodelet ('451) fails to disclose the catalyst are deposited in a monolayer. However, Dodelet ('451) clearly discloses to deposit metal catalyst. Takikawa ('097) teaches to deposit either multi-layer catalyst or monolayer catalyst (paragraph 0056, 0061, 0076). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Dodelet ('451) in view of Takikawa ('097) by depositing monolayer catalyst because equivalent and substitution of one for the other would produce an expected result.

Respect to claims 28, 45 Dodelet ('451) discloses the catalytic particles are metal selected from the group consisting of Fe, Co, Ni (col. 3 lines 24-30).

15. Claims 23-24, 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smiljanic as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 above and further in view of Loutfy et al. (US 2003/0082094 A1).

Respect to claims 23-24 and 40-41, Smiljanic fails to disclose that the nanotubes are gathered and drawn away from the mat by an anchorage device or negative pressure. Loutfy discloses to collect the carbon nanotube using the traps (17) or (27) connect to a vacuum pump (read on negative pressure; See Fig 1-2; paragraph 0032). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Smiljanic in view of Loutfy by using negative pressure to collect the nanotubes because it allows continuous production of carbon nanotubes and high throughput.

16. Claims 23-24, 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodelet ('451) as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 above and further in view of Loutfy et al. (US 2003/0082094 A1).

Respect to claims 23-24, 40-41, Dodelet ('451) fails to disclose that the nanotubes are gathered and drawn away from the mat by an anchorage device or negative pressure. Loutfy discloses to collect the carbon nanotube using the traps (17) or (27) connect to a vacuum pump (read on negative pressure; See Fig 1-2; paragraph 0032). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Dodelet ('451) in view of Loutfy by using negative pressure to collect the nanotubes because it allows continuous production of carbon nanotubes and high throughput.

17. Claims 23-24, 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dodelet ('334) as applied to claims 1-2, 8, 10-14, 20-22, 25-26, 29-31, 33-34, 37-39, 42-43, 46-47 above and further in view of Loutfy et al. (US 2003/0082094 A1).

Respect to claims 23-24 and 40-41, Dodelet ('334) fails to disclose that the nanotubes are gathered and drawn away from the mat by an anchorage device or negative pressure. Loutfy discloses to collect the carbon nanotube using the traps (17) or (27) connect to a vacuum pump (read on negative pressure; See Fig 1-2; paragraph 0032). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Dodelet ('334) in view of Loutfy by using negative pressure to collect the nanotubes because it allows continuous production of carbon nanotubes and high throughput.

***Allowable Subject Matter***

18. Claims 6-7, 18-19, 35-36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

19. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose or suggest the hetero-substrate contains Si which is incorporated into the nanotube produced on the mat and produces a hetero-nanotube with carbon and silicon.

***Conclusion***

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wikipedia, "Transmission Electron Microscopy",  
[http://en.wikipedia.org/wiki/Transmission\\_electron\\_microscope](http://en.wikipedia.org/wiki/Transmission_electron_microscope).

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571)272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Binh X Tran  
Primary Examiner  
Art Unit 1792

/Binh X Tran/  
Primary Examiner, Art Unit 1792